

Sudan University of Science and Technology
College of Graduate Studies

**Effect of Physiological Status and Season of
Calving on Milk Yield, Milk Composition
and Blood Constituents**

By:
Hind Ali AbdAllah Alhussein

A thesis Submitted to the Sudan University of Science
and Technology in Fulfillment of the Requirement for a
Master Degree in Animal Production

Supervisor
Dr. Shadia AbdAlatti Omer

CO Supervisor
Dr. Amel Omer Bakhit

March, 2007



قال تعالى:

﴿وَإِنَّ لَكُمْ فِي الْأَنْعَامِ لَعِبْرَةً نُسْقِيكُمْ مِمَّا فِي
بُطُونِهِ مِنْ بَيْنِ فَرْثٍ وَدَمٍ لَبَنًا خَالِصًا سَائِغًا
لِلشَّارِبِينَ﴾

النحل : 66

DEDICATION

,To the soul of my mother
to my father for the uncompromising
,principles that lead his life
to my sisters and brothers for
,their love and enthusiasm
to all my beloved
.ones

ACKNOWLEDGMENT

In preparing this study, I am indebted to all my lecturers in the college of Veterinary Medicine and Animal Production at the University of Sudan from whose lectures I have benefited so much. Hence my thanks and gratitude are due to all the staff of the college. In particular, I would like to convey my thanks to my supervisor Dr. Shadia Abdel Atti who has guided me step by step in the preparing the study. Without her persistent guidance and continued encouragement, the study could hardly materialize. Equally Dr. Amel Omer has helped me much in preparing the study and therefore deserves my thanks and gratefulness. Of course shortcomings and errors remain my responsibility.

My thanks are also due to following Dr. Amani Mohammad Bilal at the University of Khartoum Farm for her unlimited help. Mahamoud Omer who assisted me in the collection of samples. Dr. Mohammad Tag eldin , Dr Sara Basheer and Fath el rahman who have undertaken the statistical analysis. Ustaza Rawda Hassan at the lab Central of the Veterinary Research Suba . Mohammad Nour Ahmed, Mamoun Ali and Mohammad Abdelraheim for their . typing and organizing the thesis

List of Contents

No.	Contents	Page
	الإهداء	I
	Dedication	II
	Acknowledgements	III
	List of Contents	IV
	List of Tables	VII
	English Abstract	VIII
	Arabic Abstract	IX
	Introduction	1
	Chapter One	3
1	Literature Review	3
1-2	Factors affecting milk yield	3
1-2-1	Breed	3
1-2-2	Genetics	4
1-2-3	Environmental conditions	5
1-2-4	Season of calving	6
1-2-5	Age at calving	8
1-2-6	Calving interval	9
1-2-7	Milking frequency	10
1-2-8	Stage of lactation	10
1-2-9	Dry period	11
1-2-10	The parity number	12
1-3	Milk composition and factors affecting milk composition	13
1-3-1	Breed	13
1-3-2	Genetics	14
1-3-3	Season	14
1-3-4	season of calving	15
1-3-5	age of calving	16
No.	Contents	Page
1-3-6	Milking	16
1-3-7	stage of lactation	17
1-4	Blood	18
1-4-1	Blood glucose	18
1-4-2	Blood proteins	19
1-4-3	Enzymes	20
1-4-4	Haematological Parameters	20
1-4-5	Blood minerals	20
	Chapter Two	22
2	Materials and Methods	22
2-1	Animals	22
2-2	Management	23
2-3	Collection of samples	23
2-3-1	Milk	23

2-3-2	Blood	23
2-4	Milk chemical composition	24
2-4-1	Determination of proteins	24
2-4-2	Determination of fat	24
2-4-3	Determination of total solid	25
2-4-4	Determination of ash	25
2-4-5	Determination of minerals	25
2-4-5-1	Calcium determination	25
2-4-5-2	Phosphorus determination	26
2-4-5-3	Determination of sodium	26
2-5	Determination of serum constituents	27
2-5-1	Aspartate amino transferase	27
2-5-2	Alanine amino transferase	27
2-5-3	Alkaline phosphatase	28
2-5-4	Glucose	28
No.	Contents	Page
2-5-5	Total cholesterol	29
2-5-6	Total protein	30
2-5-7	Albumin	30
2-5-8	Globulin	31
2-6	Determination of serum electrolytes	31
2-6-1	(Serum sodium (Na) and potassium (K	31
2-6-2	(Serum magnesium (Mg	31
2-6-3	(Serum phosphate (PO ₄	32
2-6-4	Serum Calcium	32
2-7	Determination of haematological parameters	33
2-7-1	(Haemoglobin concentration (Hb	33
2-7-2	:(Packed cell volume (PCV	33
2-7-3	Red blood cell (RBC) count	33
2-7-4	White blood cell (WBC) count	34
2-8	Statistical analysis	34
	Chapter Three	35
3	Results	35
	Chapter Four	53
4	Discussion	53
	Conclusion	59
	Recommendations	60
	References	61

List of Tables

Tables	Title	Page
(Table (1	Effect of stage of lactation and parity number on chemical composition of milk	36
(Table (2	Effect of stage of lactation and parity number on some milk minerals	38
(Table (3	Effect of stage of lactation on milk yield in a high and low lactating cows	41
(Table (4	Effect of milk yield level on milk composition	42
(Table (5	Effect of milk yield level milk minerals	43
(Table (6	Effect of season of calving on milk composition	44
(Table (7	Effect of season of calving on some milk minerals	45
(Table (8	Effect of parity number on milk yield, milk pH and temperature	46
(Table (9	Variation in the milk production between cows and its effect on milk pH and temperature	47
(Table (10	Effect of season of calving on milk production, milk pH and temperature	48
(Table (11	Effect of parity number on some haematological Parameters	50
(Table (12	Effect of the stage of lactation and parity number on some blood metabolites and enzymes	51
(Table (13	Effect of the stage of lactation and parity number on some blood minerals	52

ABSTRACT

Experiments were performed, between (August 2004) and (November 2005) at a Dairy Farm, Shambat, area Sudan, to study the effects of parity number, stage of lactation and season of calving on milk yield, milk composition and constituents of blood.

Milk yield varied significantly ($P<0.01$) with the parity number and stage of lactation ($P<0.01$) only.

Milk total solids, fat, total proteins, solid not fat, Na, K, and Po_4 varied significantly ($P<0.05$) with the stage of lactation as well as with the season of calving, while the milk ash, moisture and calcium content were not affected by stage of lactation and season.

The highest concentrations of blood total proteins, albumin ($P<0.01$) and glucose ($P<0.05$) were obtained from animals at the first and second stages of lactation and the lowest were obtained from animals at late stages of lactation.

The opposite was true for blood content of Na, K, Mg and Po_4 .

Second parity animals had significantly higher values for haemoglobin concentration ($P<0.01$) and packed cell volume ($P<0.05$) than the first parity animals. Erythrocyte and total leucocyte count were not affected by the parity number.

ملخص الأطروحة

أجريت التجارب ما بين شهر أغسطس 2004- نوفمبر 2005 لقطع ألبان بمنطقة شمبات لدراسة أثر عدد الولادات ومرحلة الإدرار وموسم الولادة على إنتاجية ومكونات الحليب أضافه إلى مكونات الدم . إنتاج الحليب يختلف بدرجة عالية معنوياً مع عدد الولادات ومرحلة الإدرار فقط . المواد الصلبة الكلية ، الدهون ، البروتين الكلى ، المواد الصلبة غير الدهنية ، الصوديوم ، البوتاسيوم والفوسفات تختلف معنوياً باختلاف مرحلة الإدرار وموسم الولادة بينما محتويات الحليب من الرماد والرطوبة والكالسيوم لم تتأثر بهذين المتغيرين .

التركيز الأعلى للبروتين الكلى ، الاليومين والجلوكوز تم الحصول عليه من الحيوانات في مراحل الإدرار الأولى والثانية والتركيز الأقل تم الحصول عليه في مرحلة الإدرار الأخيرة والعكس الصحيح لمحتويات الدم من الصوديوم، البوتاسيوم ، الماغنسيوم والفوسفات .

الحيوانات ذات الولادة الثانية لها قيم أعلى معنوياً لتركيز الهيموغلوبين وحجم الدم المتراص من ذات الولادة الأولى

العد الكلى للكريات البيضاء والحمراء لم يتأثر بعدد الولادات .

بسم الله الرحمن الرحيم

جامعة السودان للعلوم والتكنولوجيا
كلية الدراسات العليا

أثر الحالة الفسيولوجية وموسم الولادة علي إنتاجية وتكوين اللبن
ومكونات الدم

إعداد:

هند علي عبدالله الحسين

أقدم هذه الأطروحة لجامعة السودان للعلوم
والتكنولوجيا لإيجاز متطلبات درجة الماجستير في
علوم الإنتاج الحيواني

تحت إشراف :

د. شادية عبد العاطي عمر

م. مشرف :

د. أمل عمر بخيت

مارس 2007

